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Plant # 505

CO2 Liquefaction Plant – 320 MTPD

Capacity: 320 MTPD

Raw Materials: CO2

Process Information: Used 320 MTPD carbon dioxide liquefaction plant for sale. The plant includes two (2) skid-mounted trains, each 160 MTPD, to operate through temperatures ranging from -40 to +95 degrees Fahrenheit.

Major Equipment

- Inlet separator
- CO2 chiller separator
- CO2 dryers
- CO2 interstage separator
- CO2 oil separators
- CO2 storage vessels
- CO2 cooler
- CO2 condenser
- CO2 compressor
- Regeneration gas dust filter

Brief Plant Description

The 1st Stage CO2 Compressor (C-101) compresses CO2 vapor from approximately 45 kpag to 500 kpag. Lubricating oil is injected into the compressor to lubricate the bearings and manage the discharge temperature. The resulting oil-gas mixture is processed in the 1st Stage CO2 Compressor Oil Separator (CV-101), where oil is separated from the CO2, filtered, cooled, and recirculated back to the compressor.

The CO2 then enters the cooler and interstage separator. Any water that condenses in this separator is collected at the bottom of the vessel and discharged into the water drain system through a level control loop equipped with an automated switching valve. This valve uses the pressure differential between the high-pressure separator and the lower-pressure drain system to expel the water.

Subsequently, the CO2 gas is directed to the 2nd Stage CO2 Compressor (C-102), which increases the pressure of the CO2 vapor to 1781 kpag. Similar to the first stage, the oil-gas mixture is routed through the 2nd Stage CO2 Compressor Oil Separator (CV-102), where oil is again filtered, cooled, and returned to the compressor. Finally, the CO2 vapor passes through a final oil separator (V-103) to remove any residual oil, ensuring the CO2 is clean before moving on to the next process stage

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1. Executive Summary

1.1 Plant History

- Plant has 2 skid mounted trains:
  - 1st train was built and commissioned in November 2004.
  - 2nd train was built and commissioned in December 2007.

1.2 Production Capacity

- Liquid CO2: 320 MTPD (2x 160 MTPD skid mounted trains)

1.3 Process Designer: Toromont Industrial Service

1.4 Available Documents

- Compressor Overhaul Summary
- Electrical Drawing
- External Inspection Documents
- Layout Drawing
- P&ID
- PFD
- Process Description
- Production Report

2. Process Description

The 1 S Stage CO2 Compressor (C-101) draws the CO2 vapor from the plant inlet separator at approximately 45 kpag and compresses it to 500 kpag.

Lube oil is injected into the compressor to lubricate the bearings and to control the compressor discharge temperature. The oil-gas mixture enters the 1st Stage CO2 Compressor Oil Separator (CV-101) where the oil is removed from the CO2 and returned to the compressor after passing through a filter and a cooler.

The CO2 enters the CO2 cooler and interstage separator. Any water produced in this separator collects in the bottom of the vessel and is discharged into the water drain system. This is controlled by a level control loop, which includes an automated switching valve. When the valve opens the water is driven out by the high pressure in the separator as compared to the lower pressure in the water drain system.

The CO2 gas is taken into the 2"d Stage CO2 Compressor (C-102). The 2n stage compressor is designed to compress the CO2 vapor to 1781 kpag.

The oil-gas mixture enters the 2^{n} Stage COC Oil Separator (CV-102) where the oil is removed from the CO2 and returned to the compressor after passing through a filter and a cooler.

The CO2 vapor then enters a final oil separator (V-103), which polishes the vapor and removes any residual oil from the CO2.

3. Product Specifications

CO2 LIQUID PRODUCT SPECIFICATIONS
The design outlet composition (volume basis) is as follows:

Non-food grade liquid CO2 product

Carbon Dioxide	99%
Water	10 ppm v

This product specification is based on the following feed gas composition:

CO2 FEED GAS SPECIFICATIONS

PRESSURE:	47 kpag
TEMPERATURE:	48.9 °C Maximum

GAS COMPOSITION: (Volume Basis) COMPONENT	Mole Fraction
CARBON DIOXIDE (CO2)	0.938974
METHANE (C4)	0.003267
ETHANE	0.000275
PROPANE	0.000110
H2O	0.056112
BENZENE	0.000439
N-HEXANE	0.000027
TOLUENE	0.000522
E-BENZENE	0.000027
M-XYLENE	0.000247

4. Utility Consumption

- Average KWH/Ton – 165.5 based on an average production of 150.9 tons.

5. Highlights of Major Equipment

- Inlet separator

- CO2 chiller separator
- CO2 dryers
- CO2 interstage separator
- CO2 oil separators
- CO2 storage vessels
- CO2 cooler
- CO2 condenser
- CO2 compressor
- Regeneration gas dust filter

For more details or to discuss this plant, contact:

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